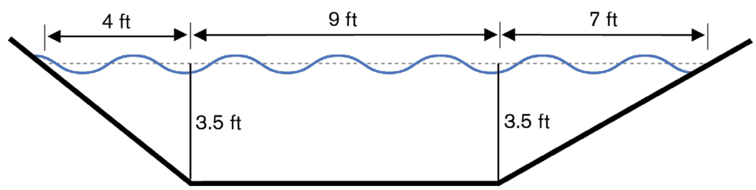
FEB. 20, 2024 ● SOLUTIONS TO HYDRAULIC ENGINEERING PROBLEM SET

2.1 The cross-section is a trapezoid, so we can use the formula for the area of a trapezoid to solve: $A = ½(b_1 + b_2)h$, where b_1 and b_2 are the lengths of the bases, and h is the height of the trapezoid. So, $A = ½(9 + 20) \times 3.5 =$ **50.75 ft²**. Alternatively, we can divide the trapezoidal cross-section into two triangles and a rectangle, as shown. Using $A = ½bh$ for the area of a triangle and $A = lw$ for the area of a rectangle, we find that the area of the trapezoid is A = (½ × 4 × 3.5) + (9 × 3.5) + (½ × 7 × 3.5) = 7 + 31.5 + 12.25 = **50.75 ft²**.



2.2 We're told flow rate is equal to the cross-sectional area of the canal multiplied by the speed of the water. Thus, the flow rate is 50.75 × 1.5 = 76.125 cfs. Rounded to the nearest whole number, we get **76 cfs**.

2.3 Given that the hydraulic radius is 2.29 ft, we can use Manning's Equation to find that the estimated flow rate of the canal is $1.571 \times 50.75 \times 2.29^{2/3} \approx$ **138.5 cfs**, to the nearest tenth.